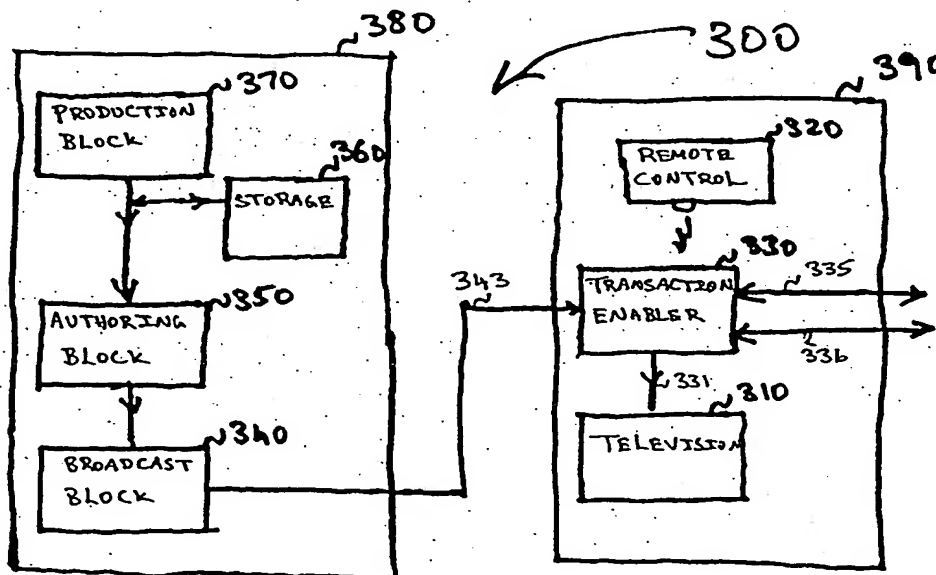




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(54) Title: ENCODING HOT SPOTS IN TELEVISION SIGNALS



(57) Abstract

Hot spot data is encoded in portions such as the display data portion of a television signal such that the encoded hot spot data is unaffected by any alteration to television signals performed by intermediate broadcasters. Hot spot data may include data identifying the location of hot spots in an image frame and vendor system data associated with the hot spots. A transaction enabler block (330) may display images represented by the image frames and enable a viewer to access vendor systems by selecting the hot spot areas via a remote control (320).

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ENCODING HOT SPOTS IN TELEVISION SIGNALS

ENCODING HOT SPOTS IN TELEVISION SIGNALS

Related Applications

The present invention is related to the following U.S. Patent Applications, which are incorporated in their entirety herewith:

- 5 (1) Patent Application Entitled, "A Method and Apparatus for Enabling Viewers of Television Systems to Conveniently Access Various Vendor Systems", Serial Number: 09/183,649, Filed: October 30, 1998 (hereafter, "Related Application 1"); and
- (2) Patent Application Entitled, "Generating Hot Spots Containing Targeted Advertisements in Television Displays", Serial Number: Unassigned, and filed concurrently herewith
10 ("Related Application 2").

Background of the Invention

Field of the Invention

The present invention relates to television systems, and more specifically to a method and apparatus for encoding hot spots in television signals.

15 Related Art

Television systems are generally used to display images encoded in a television signal. A television signal typically contains several image frames, and television systems are generally designed to process the television signal to display the image frames. The television signal may

be in progressive or interlaced formats designed for analog or digital television systems, and can be in one of several known formats such as NTSC, PAL, ATSC, or SECAM.

“Hot Spots” are often specified in television signals. A hot spot generally refers to a portion of a displayed image, which (portion) can be selected by a user (or viewer), and a pre-specified associated action is performed in response to the selection. The user may select the hot spot by ‘clicking’ on (or otherwise actuating) the displayed image portion. In a common situation, a hot spot represents an advertisement and the associated action enables the user to access vendor systems related to the advertizing party.

A vendor system may be, among others, a web server or a telephone call processing system. Vendor systems generally enable a user to purchase a service or product, or to access additional information about the advertized product or vendor. Some example embodiments enabling a user to conveniently access various vendor systems are described in RELATED APPLICATION 1.

Due to the convenience of accessing vendor systems from locations such as homes while watching television programs, it may be desirable that hot spots be incorporated into television signals. RELATED APPLICATION 1 discloses a system in which a broadcaster may encode data identifying hot spots in non-display portion (e.g., blanking intervals) of a television signal, and a transaction enabler block enables a user to access the encoded vendor systems.

One problem with including hot spot identification data in non-display portion is that any intermediate broadcasters may alter the some portions of the television signals while rebroadcasting the signals. The result of such alteration is that the hot spot data may not be available when the television signals are received at a television system, and a viewer may not
5 be able to access the vendor systems specified in the television signals.

Accordingly, what is needed is a method and apparatus for encoding hot spots in television signals without being affected by rebroadcasts by intermediate broadcasters.

Summary of the Invention

The present invention is directed to sending hot spot data in television signals. Hot spot
10 data generally includes data specifying the portions of the images forming hot spots, vendor systems associated with each hot spot. Hot spot data may contain other information such as that identifying an advertizer to which the vendor system may relate to.

In accordance with the present invention, hot spot data is encoded in the portions of the television signal, which are not generally altered by intermediate broadcasters. As is well known
15 in the relevant arts, several portions of the television signals are typically not altered by the broadcasters according to broadcast conventions. The broadcast conventions are generally dictated by various government regulations, technological considerations, and the typical requirement to preserve the integrity of the images encoded in the television signals.

In one embodiment, hot spot data is encoded in the display data portion of a television signal as that portion is generally not altered by intermediate broadcasters. Display data portion generally refers to the signal portion that represents image frames. However, other portions of television signal image such as audio channel, closed captioning portions can also be used to
5 encode the hot spot data.

A transaction enabler block at a user's (or viewer's) end receives a television signal with hot spot data and recovers the hot spot data. The transaction enabler may provide a convenient user interface to enable a user to access the vendor systems associated with each hot spot. The user may simply need to click on (or actuate) a portion of a displayed image frame
10 corresponding to a hot spot, and the user can access any vendor systems associated with the actuated hot spot. As the display data (or any other television signal portion not generally altered) is generally not modified while the television signal is being transmitted from a broadcaster to a viewer, the hot spot data can be sent to viewers of television programs without risk of modification of data by intermediate broadcasters.

15 Any display distortion effects due to the encoding of hot spot data (in the display data) are minimized in accordance with the present invention. In an embodiment, pixel data elements representing the image frames are generated and the hot spot data is encoded using the least significant bits of the pixel data elements. Such techniques are generally similar to invisible water-marking techniques and various water-marking techniques can be used for encoding the

hot spot data in the display data portion. In another embodiment, hot spot data is encoded closer to the edges of the image frames as viewers typically focus at the center of image frames.

Before recovering hot spot data and enabling a user to access the vendor systems specified in the hot spot data, a transaction enabler may first need to accurately determine whether a received television signal contains hot spot data or not. It may be further desirable that the a separate channel not be used for sending any data required for such purpose.

Accordingly, data indicating whether hot spot data is encoded in the television signals is encoded in the portions not generally altered by intermediate broadcasters. One of several 'self-encoding' techniques can be used for indicating whether hot spot data is encoded. A self-encoding technique generally allows for encoding of additional data at a broadcasters end according to a pre-determined convention, and the transaction block can examine the received data (including potentially the hot spot data and additional data), and determine that hot spot data is encoded. A cyclic redundancy check (CRC) based scheme is an example of one such approach. Thus, a transaction enabler may first determine that a received television signal contains hot spot data, and provide the necessary interface for a user to access various specified vendor systems.

Therefore, the present invention provides a convenient mechanism by which a viewer of a television system can access vendor systems, typically related to the advertisers. This is

enabled by including access addresses in the portions of a television signal not typically altered by any intermediate broadcasters.

The present invention ensures that hot spot data is available at user's end irrespective of any modification of non-display portion of a television signal by intermediate broadcasters as the hot spot data is encoded in the portions of the television signals which are not altered by any intermediate broadcasters.

The present invention minimizes any display distortions due to encoding hot spot data in display data portion as the hot spot data is encoded in least significant bits of pixel data elements representing an image frame.

The present invention may further minimize the effect on viewer perception by encoding the hot spot data more towards the edges of image frames than towards the center.

Further features and advantages of the invention, as well as the structure and operation of various embodiments of the invention, are described in detail below with reference to the accompanying drawings. In the drawings, like reference numbers generally indicate identical, functionally similar, and/or structurally similar elements. The drawing in which an element first appears is indicated by the leftmost digit(s) in the corresponding reference number.

Brief Description of the Drawings

The present invention will be described with reference to the accompanying drawings, wherein:

Figure 1 is a flow-chart illustrating a method according to the present invention;

5 Figure 2 is a diagram illustrating a hot spots in an image frame;

Figure 3 is a block diagram illustrating a typical scenario in which the present invention operates;

Figure 4 is a block diagram illustrating the detail of a transaction enabler block in one embodiment of the present invention; and

10 Figure 5 is a flow-chart illustrating an example scheme of encoding hot spot data.

Detailed Description of the Preferred Embodiments

1. Overview and Discussion of the Invention

The present invention enables data related to hot spots ("hot spot data") to be transmitted without the risk of alteration (or elimination) of the hot spot data by encoding the hot spot data in the portions of television signals which are not altered by any intermediate broadcasters. As is well known in the relevant arts, intermediate broadcasters rebroadcast television signals according to broadcast conventions, which specify which portions of a television signal are not altered. In the present application, hot spot data generally includes data identifying the portion of a displayed image forming a hot spot and vendor systems associated with the hot spots. Hot

spot data may contain other types of information, for example, data identifying the advertisers, the nature of the products/services advertized, etc.

For illustration purpose, the present invention is described with reference to the encoding of hot spot data in the display portion of a television signal. However, in accordance with the present invention, the hot spot data can be encoded in other portions of the television signals (e.g., audio channel, closed captioning portion) which are not altered by any intermediate broadcasters. Display portion commonly refers to the portion of a television signal which encodes the image frames displayed on a television display screen. In contrast, non-display portion generally separates successively encoded image frames (e.g., by using VSYNC), and successive horizontal lines in a frame (by using HSYNC signals) as is well known in the relevant arts. The non-display portion is received during vertical retrace periods and horizontal retrace periods as is also well-known in the relevant arts.

Even though the hot spot data is encoded in the display portion of television signals, an encoding scheme in accordance with the present invention ensures that any display aberrations due to the encoding of hot spots are minimized by employing a combination of several approaches. The present invention is described below in further detail with respect to several example methods and environments.

2. Method

Figure 1 is a flow chart illustrating a method according to the present invention. In step 110, a party (typically a broadcaster) purposes a scene for advertisement. Purposing generally refers to arranging of the components of the scene such that the desired portions (typically
5 corresponding to hot spots) have required focus, lighting, etc., as the party may wish.

In step 120, the scene is captured on a medium (any recording medium), preferably in a form suitable for eventual transmission as a television signal. The television signal may be transmitted as an interlaced or progressive scan signal using analog or digital transmission standards. The scene is captured in a known way.

10 In step 130, the hot spot data is encoded in the portions of the television signal which are not altered by intermediate broadcasters. As is well known in the relevant arts, broadcasters rebroadcast television signals according to a rebroadcast convention, which specifies which portions of a television signals may not be altered while rebroadcasting. As a result, the hot spot data may not be modified or deleted during rebroadcasts by intermediate broadcasters.

15 In an embodiment, the hot spot data is encoded in the display data portion of the captured television signal. An example encoding scheme is described below with reference to Figure 5. Typically, encoding is performed by processing digital pixel data elements representing the images in the image frames. In the case of digital broadcast signals, the digital pixel data

elements are readily available. In the case of analog broadcast signals, the pixel data elements may be generated by digitizing the image frames otherwise encoded in the display data portion.

As the display data is typically unaltered by any intermediate broadcasters, the present invention enables hot spot data to be transmitted to user systems without being affected in the path. Hot spot data may be incorporated using various tools available in the industry. For example, software and hardware available from Silicon Graphics (www.sgi.com) and Avid (www.avid.com) can be used to encode the hot spot data.

Hot spot data needs to identify the location of hot spots and corresponding vendor systems (e.g., URLs, telephone numbers, and hot spot identification data). In general, it is preferable that the hot spot data be contained in each image frame. However, a convention can be employed to make hot spot data effective for a number of successive frames according to a pre-determined protocol. Some considerations in encoding and an example encoding scheme are described below in further detail.

In step 140, the television signal containing hot spots is transmitted. In step 160, the hot spot data is recovered at a user end. The recovery needs to be consistent with the encoding scheme employed in step 130. Therefore, any consistent scheme can be chosen for communicating hot spots and associated vendor systems. In step 170, a user is enabled to actuate (or select) hot spots and access the associated vendor systems.

Thus, the method of Figure 1 can be used to transmit hot spot data in display portion of a television signal and the user can be provided access to various vendor systems depending on the actuation of hot spots. Some general considerations in encoding hot spot data are noted first and the manner in which the hot spot data can be recovered (decoded) is described next.

5 3. Hot Spot Data

Figures 2 and 5 together illustrate an example encoding scheme for sending hot spot related data. Specifically, Figure 2 depicts a sample image frame 200 having hot spots 210 (Pepsi Logo on a T-Shirt), 220 (Nike Advertisement on a shoe), and 230 (IBM Advertisement in the background) for three advertisers Pepsi, IBM, and Nike respectively. For purposes of
10 explanation, dotted lines are shown around each hot spot. Hot spot data corresponding to the three advertisements may be encoded in the display data portion of a television signal in accordance with the present invention.

Figure 5 is a flow-chart illustrating an example method for sending spot data related to the three hot spots. In step 510, an advertisement identifier packet may be sent, with the packet
15 containing an object identifier, date and time of broadcast, advertizer identifier and control data. An object identifier may uniquely identify each advertisement, the date and time field may specify the broadcast time, advertizer identifier may uniquely specify an advertizer (e.g., IBM Corporation, Nike Corporation) to which the advertisement relates to. Control data may be used for generating targeted advertisements as described in further detail in RELATED

APPLICATION 2. With reference to Figure 2, three advertisement identifier packets may be sent one corresponding to each of the hot spots 210, 220 and 230.

In step 520, vendor system identification data associated with each hot spot area (advertisement) may be sent. In case a vendor system corresponds to a web server, the vendor system identification data corresponds to an URL as is well known in the relevant arts. All the information may be encoded in a known way, for example, in ASCII format. In an embodiment, vendor system identification data is sent in a packet with an object identifier (3 bits) and an associated URL (400 bits)

Even though step 520 is described with reference to using web servers as vendor systems, vendor systems may include other types of systems, and the vendor system identification data packets are correspondingly designed. For example, a web access address (e.g., URL) may be associated with hot spot 210, a web access address and telephone number (with a live operator) may be associated with hot spot 220, and a telephone number (with a fax back service) may be associated with hot spot 230.

In step 530, hot spot identifier packets may be sent. Each hot spot identifier packet may contain data identifying the location of the hot spots. In an embodiment, each image may be viewed as having X and Y coordinates, with the top-left corner being viewed as (0, 0) coordinate. Hot spot 220 may be identified by the used rectangle area. In an embodiment, nine

bits may be used for X coordinate and eight bits may be used for Y coordinate, and each packet may contain an object identifier, an X coordinate and a Y-coordinate.

Typically, a hot spot identifier packet may be sent first when the corresponding hot spot is first (in time) present in an image frame. An additional identifier packet may be sent each
5 time the hot spot location changes in the image frames. This additional packet indicates the new location of the hot spot.

However, a different approach may be used for hot spots having consistent uniform mobility. For example, a ball may be moving in a trajectory and the ball may need to be identified as a hot-spot. The coordinates of the ball may be sent with each image to correspond
10 to the movement. In the alternative, the movement may be characterized by a mathematical equation, with the equation defining, for example, a piecewise linear trajectory.

The online access addresses, approaches for identifying the hot spots and associating online access addresses are merely illustrative. Several variations can be used as will be apparent to one skilled in the relevant arts based on the disclosure provided herein. Such other
15 approaches are contemplated to be within the scope and spirit of the present invention.

4. Encoding in Display Data Portion

An objective in one embodiment is to encode hot spot data while minimally affecting the picture quality and accuracy from a viewer perspective. Various techniques can be employed to meet such an objective. Some examples are described below.

5 In general, the image frames are first digitized if necessary. The hot spot data is then encoded, preferably in the least significant bit(s) of each pixel data element of an image frame. By using only the least significant bit(s), the user may not perceive a significant difference in the displayed images compared to what would have been displayed without encoding the hot spot data in the display data portion. Such techniques are generally referred to as water-marking
10 techniques in the relevant arts. Other water-marking techniques can be implemented as well.

Depending on the number of hot spots and the data to be encoded, only a subset of the pixel data elements can be used for encoding the hot spot data according to a pre-determined convention. In an embodiment, only alternate pixel data elements in a line may be used such that the minor modifications due to encoding of hot spot data is not generally perceived by the human
15 eye. This is one example of many well-known techniques for encoding data into images so that the image quality is not significantly degraded.

An alternative embodiment may use pixels which are located near the edges of the image frames as human eye tends to focus more on the central portion of image frames. Another

embodiment may encode hot spot data across multiple frames if one frame is not sufficient to encode the desired hot spot data. Yet another embodiment may use pixel positions in the image frame position corresponding to under the monitor bezel as that portion is generally not displayed. Various other approaches can be used for encoding the hot spot as will be apparent to one skilled in the relevant arts. Such approaches are contemplated to be within the scope and spirit of the present invention. An example environment using some of these approaches is described below with reference to Figure 3.

5. Example Environment

Figure 3 illustrates an example system 300 in which the present invention can be implemented. System 300 includes production block 370, storage 360, authoring block 350, and broadcast block 340 at broadcaster end 380. System 300 further includes transaction enabler 330, television 310 and remote control 320 at user end 390.

Broadcaster end 380 generates television signals including hot spot data in the display data portion. The television signals are broadcasted many times directly to user end 390 on broadcast medium 343. However, many times the television signals are rebroadcast by intermediate broadcasters (not shown). During such rebroadcasts, some portions of the television signals may be altered, due to which the hot spot data may be modified or deleted altogether. However, the portions of the television signal which may be altered are specified in rebroadcast conventions as is well known in the relevant arts. The present invention takes

advantage of the conventions and encodes the hot spot data in the television signal portions which are not altered by intermediate broadcasters.

User end 390 receives the television signals and displays the encoded images on a television display screen. In addition, user end 390 enables a user to access various vendor systems by actuating the hot spots defined by the encoded hot spot data. The details of
5 broadcaster end 380 and user end 390 are described in further detail below.

Production block 370 may contain different components such as cameras which are used to film a show. The resulting display signal may be stored in storage 360. The display signal is preferably in a form suitable for eventual transmission as a television signal. Production block
10 370 may be implemented in a known way.

Authoring block 350 processes the display signal to incorporate hot spot data into the display data portion of a television signal. The hot spot data may be designed in accordance with the method of flow-charts 1 and 5 described above. In an embodiment, authoring block 350 receives the display signal from storage 360 and incorporates hot spot data in real time, that is,
15 as the production block generates the display signals. Such real time incorporation may be possible in computer animation type applications. However, such real time incorporation may be impractical in many other situations. In such a situation, storage 360 may be used as an intermediate buffer.

Authoring block 350 may encode hot spot data using the approaches described above. In general, pixel data elements representing an image frame are generated and hot spot data is encoded preferably in the least significant bit(s) of the pixel data elements. Additional data for error detection and correction can also be encoded according to one of several well-known schemes. The implementation of authoring block 350 will be apparent to one skilled in the relevant arts based on the disclosure herein. Even though production block 370 and authoring block 350 are described as different components, it should be understood that the two blocks may be combined into a single block, particularly when the computer animation is being used.

Broadcast block 340 may broadcast television signals (containing the hot spot data in the display data portion) in a known way. It should be noted that the television signal can be in progressive scan or interlaced format. Production block and authoring block 350 need to be implemented taking into consideration the transmission standard of the television signals. Thus, broadcaster end 380 generates television signals containing hot spot data in the display data portion.

Now turning to user end 390, television system 310 displays the images encoded in a television signal received on line 331. As described below in further detail, transaction enabler 330 enables users (or viewers of television 310) to access various vendor systems specified by the hot spot data encoded in the television signal received from broadcast block 340.

Transaction enabler 330 may be included at any point in the television signal path including, for example, within a television receiver, within a set-top box, or within a VCR or DVD players. Such integration into a single device will be apparent to one skilled in the relevant arts.

5 The operation of transaction enabler 330 may be controlled from remote control unit 320 by a user. Even though remote control unit 320 is described below as interfacing with transaction enabler 330 using remote signals (e.g., infra-red signals), it should be understood that other forms of control units may be employed to control transaction enabler 330. A user may operate remote control unit 320 to access various vendor systems in accordance with the present
10 invention.

Transaction enabler 330 decodes the hot spot data in the television signals received from broadcast block 340 and enables a user to access various vendor systems by actuating the hot spots. To enable such access, transaction enabler 330 may need to have access to a web connection using connection 336 and /or telephone line using lines 335. In addition, transaction
15 enabler 330 may need to generate new or supplemental image frames on line 331 for a convenient user interface. An embodiment of transaction enabler 330 is described below in further detail.

6. Transaction Enabler

Figure 4 is a block diagram illustrating the internals of an example embodiment of transaction enabler 330. Only the details of transaction enabler 330 as may be applicable to the present application are described here. Additional details are described in RELATED APPLICATION 1.

Image decoder 410 generates pixel data elements representing image frames encoded in a television signal received on line 343. In response to the operation of remote control unit 320, image decoder 410 may store the pixel data elements representing an image frame in memory 430. Image decoder 410 may be implemented in a known way. Memory 430 may represent several memory modules such as fast random access memories and relatively slower non-volatile memories. The non-volatile memories may store data and program instructions which enable the operation of the present invention.

Recovery block 420 may examine the pixel data elements stored in memory 430 to recover the hot spot data encoded in the frame of the television signal received from broadcaster end 380. In general, recovery block 420 needs to be implemented consistent with any conventions or protocols used at broadcaster end 380 for encoding the hot spot data. Assuming that the least significant bit of each pixel data element is used for encoding the hot spot data and any error detection/correction information, recovery block 420 may examine the least significant

bit of each pixel data element to decode the hot spot data. Recovery block 420 may be implemented using various digital signal processing techniques also.

Infra-red (IR) receiver 460 receives remote control signals from remote control unit 320, and provides digital data representing the remote control signals to processor 450. IR receiver 460 may be implemented in a known way. It may be noted that other receivers which receive control signals from viewers and provide corresponding digital data to processor 450 may be implemented.

Telephone interface 470 enables a telephone call to be initiated on line 335. Such telephone calls may be generally initiated either to connect to the Internet via an ISP or to contact a phone with a live-operator. When a telephone call is initiated with a live operation, telephone interface 470 may provide the necessary micro-phone (for a viewer to speak) and receiver for reproducing audible voice. Alternatively, a user may utilize a conventional telephone set that is attached to line 335. LAN (local area network) interface 475 may provide a high speed connection to connect with a web server (corresponding to an URL) or even initiate a voice call (e.g., using voice over Internet Protocol).

Processor 450 receives the hot spot data from recovery block 420, and enables a user to access various vendor system specified in the hot spots. For a suitable user-interface, processor 450 may control the images displayed on television system 110. As an illustration, when a user

does not wish to use the advertisement information or when there is no vendor system information in a received television signal, processor 450 may control select line 481 to cause the television signal received on line 331 to be passed directly on line 331. When vendor system information is present in the received television signal, one of the lights 455 may be turned on
5 to indicate that the vendor systems information is present in the television signals. Alternatively, a branded logo may appear on the viewer screen.

When advertisement information (i.e., presence of hot spots) needs to be displayed on television systems, processor 450 may modify the received image frames to provide a suitable user interface. The modification is generally performed by processing the pixel data elements
10 stored in memory 430. Typically, other images (e.g., cursor and advertisement related textual or graphic information) may be overlaid on top of the image frames.

In an embodiment, a user may indicate when the hot spot information needs to be turned ON or OFF. When the information needs to be displayed, processor 450 may overlay the hot spot location information on the image frames contained in a received television signal. For
15 example, the display portions (typically containing objects) corresponding to hot spots may be highlighted to indicate that a vendor system is associated with the portions. A user may click on one of the hot spots, and transaction enabler 330 may display the associated vendor systems with suitable explanation messages. The user may select one of the vendor systems associated

with the selected display portion. Transaction enabler 330 may provide the necessary connection to the selected vendor system.

If the vendor system corresponds to a web-server, transaction enabler 330 may need to operate as a web-browser. Processor 450 may enable such an operation by executing the program instructions provided by memory 430. The web-browser enables transaction enabler 330 to receive different web-pages in a known way. Processor 450 may convert the web pages into image frames, and encode the image frames into a television signal having a format compatible with conventional television signals such that the images can be displayed on television system 110. Well known methods may be employed for such conversion and encoding.

A user may continue to browse the world-wide-web by operating remote control unit 320. As control signals indicating that the cursor needs to be moved are received, processor 450 may need to modify the displayed image frames to indicate the cursor position. When a user clicks on a position corresponding to a new URL in a displayed web-page, transaction enabler 330 may need to fetch a web page with the new URL in a known way. This browsing mechanism may enable a viewer to access additional information from a vendor system.

Thus, transaction enabler 330 of Figure 3 enables a presently displayed advertisement to be selected by a viewer and the viewer may be connected to the corresponding vendor system.

In case of web access, transaction enabler 330 may provide the web browsing support. Various modifications can be made to transaction enabler 330 without departing from the scope and spirit of the present invention. Some example modifications are described in RELATED APPLICATION 1.

5 Also, typically only some of the television signals contain hot spot data and others may not. When hot spot data is not encoded it may be undesirable to alter the displayed images. As should be apparent from the above description, transaction enabler 330 may alter the images to provide suitable user interface for a user to select the hot spots when hot spots are actually encoded. Accordingly, there is a general need to first determine whether hot spots are actually
10 present in the received television signals.

7. Determining the Presence of Hot Spot

In general, broadcaster end 380 and user end 390 need to be implemented with a consistent interface for the user end 390 to accurately determine the presence of the hot spot data. One of several conventions well known in the relevant arts may be employed to provide
15 such a consistent interface. However, it may be desirable that the chosen convention be 'self-coding', that is, examination of the encoded data itself should indicate that hot spot data is encoded in the television signals. One of several conventions well known in the relevant arts can be used.

In one embodiment described with reference to Figure 3, authoring block 350 generates a 'code' is generated using a cyclic redundancy check (CRC) approach. The code is generated such that a pre-determined syndrome is generated when the code along with other hot spot related data is processed by a CRC circuit contained in transaction enabler 330.

5 Thus, continuing with reference to Figure 4, processor 450 may recover the hot spot data (including the CRC code) by selecting the appropriate bits from the data stored in memory 430. Processor 450 may include a CRC processor (either in hardware, software, firmware, or a combination) which processes the hot spot data to generate a syndrome. If the generated syndrome matches the pre-determined syndrome, processor 450 may determine that the
10 television signals presently being received contain hot spot data.

 Then, processor 450 may interpret the recovered data as hot spot containing information related to vendor systems, etc., as described in detail above. If the recovered data is determined not to contain hot spot data, processor 450 may assert line 481 to cause multiplexor 480 to select the television signal portions received on line 343. The selected signal may be used for display
15 on television 310.

 Thus, the present invention provides an efficient way of determining the presence of hot spot data in a received television signal, and provide user interface to enable a user to access the vendor systems specified by the hot spot data.

8. Conclusion

While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example only, and not limitation. Thus, the breadth and scope of the present invention should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following
5 claims and their equivalents.

What Is Claimed Is:

1 1. A method of enabling a viewer of a television system to conveniently access various
2 vendor systems, wherein said television system is designed to receive a television signal from
3 a broadcaster end, wherein an intermediate broadcaster can modify portions of said television
4 signal according to a rebroadcast convention, said method comprising the steps of:

5 (a) encoding hot spot data in a portion of a television signal which cannot be modified
6 by said intermediate broadcaster according to said rebroadcast convention, said hot spot data
7 specifying a hot spot in said image frame and an access address associated with said hot spot,
8 wherein said access address relates to a vendor system and said hot spot corresponds to a portion
9 of said image frame;

10 (b) sending said television signal to a user end;

11 (c) recovering said hot spot data at said user end;

12 (d) displaying said image frame at said user end;

13 (e) enabling said viewer to select said portion of said image frame forming said hot spot;

14 and

15 (f) providing a connection to said vendor system related to said access address,

16 wherein said encoding of step (a) ensures that said hot spot data is available for recovery
17 in step (c).

1 2. The method of claim 1, wherein step (a) comprises the step of encoding said hot spot

2 data in a display portion of said television signal, wherein said display portion comprises an
3 image frame.

1 3. The method of claim 2, wherein step (a) further comprises the steps of:
2 (g) generating a plurality of pixel data elements representing said image frame; and
3 (h) encoding said hot spot data using one or more of the least significant bits of at least
4 some of said plurality of pixel data elements.

1 4. The method of claim 3, wherein step (h) comprises the step of encoding said hot spot
2 data towards the edges of said image frame.

1 5. The method of claim 3, wherein step (h) comprises the step of encoding said hot spot
2 in a subset of said plurality of pixel data elements.

1 6. The method of claim 1, wherein said hot spot data is encoded in each image frame
2 encoded in said television signal.

1 7. The method of claim 1, wherein said access address comprises a universal resource
2 locator (URL).

1 8. The method of claim 1, further comprising the steps of:

2 (l) encoding data in said television signal at some broadcasters end indicating whether
3 said hot spot is encoded in said television signal;

4 (m) determining at said user end whether said hot spot data is encoded in step (l) using
5 said data encoded in step (l); and

6 (n) performing step (e) only if step (m) determines that said hot spot data is encoded.

1 9. The method of claim 1, wherein said image frame is displayed on said television
2 system.

1 10. A system enabling a viewer of a television system to conveniently access various
2 vendor systems, wherein said television system is designed to receive a television signal from
3 a broadcaster end, wherein an intermediate broadcaster can modify portions of said television
4 signal according to a rebroadcast convention, said system comprising:
5 a broadcaster end for encoding hot spot data in a portion of a television signal which
6 cannot be modified by said intermediate broadcaster according to said rebroadcast convention,
7 said hot spot data specifying a hot spot in said image frame and an access address associated with
8 said hot spot, wherein said access address specifies a vendor system; and
9 a user end comprising said television system, said user end recovering said hot spot data,
10 said user end also displaying said frame on said television system to enable said viewer to select
11 said hot spot and access said vendor system associated with said access address,

12 wherein said encoding by said broadcaster end ensures that said hot spot data is available
13 at said user end without modification by said intermediate broadcaster.

1 11. The system of claim 10, wherein said hot spot data is encoded in a display portion
2 of said television signal, wherein said display portion contains an image frame.

1 12. The system of claim 11, wherein said user end comprises a transaction enabler block,
2 said transaction enabler block recovering said hot spot data and generating new image frames
3 for display on a display screen of said television system, wherein said new image frames provide
4 a convenient interface for said viewer to select said hot spot.

1 13. The system of claim 12, wherein said broadcaster end encodes said hot spot data in
2 the least significant bit of a first plurality of pixel data elements forming said image frame.

1 14. The system of claim 13, wherein said transaction enabler block comprises:
2 an image decoder for receiving said image frame and generating a second plurality of
3 pixel data elements representing said image frame;
4 a recovery block for recovering said hot spot data by examining said second plurality of
5 pixel data elements; and
6 a processor for generating said new image frames according to said recovered hot spot
7 data.

1 15. The system of claim 11, wherein said broadcaster end comprises:
2 a production block for capturing a view as a signal;
3 a storage for storing said signal;
4 an authoring block for encoding said hot spot data into the display data portion of said
5 signal; and
6 a broadcast block for transmitting said signal as said television signal.

1 16. The system of claim 11, wherein said image frame is in interlaced format.

1 17. The system of claim 11, wherein said image frame is in a progressive scan format.

1 18. The system of claim 11, wherein said transaction enabler block is provided external
2 to said television system.

1 19. A method of sending data from a broadcaster end to a television system, wherein an
2 intermediate broadcaster can modify portions of said television signal according to a rebroadcast
3 convention, said method comprising:

4 (a) encoding said data in a portion of a television signal which cannot be modified by said
5 intermediate broadcaster according to said rebroadcast convention, said television signal
6 containing an image frame;

7 (b) sending said television signal to a user end containing said television system;

8 (c) recovering said data at said user end; and

9 (d) displaying said image frame at said user end,

10 wherein said convention enables said broadcaster to send said data without risk of
11 modification by said intermediate broadcaster while sending image frames for display.

1 / 5

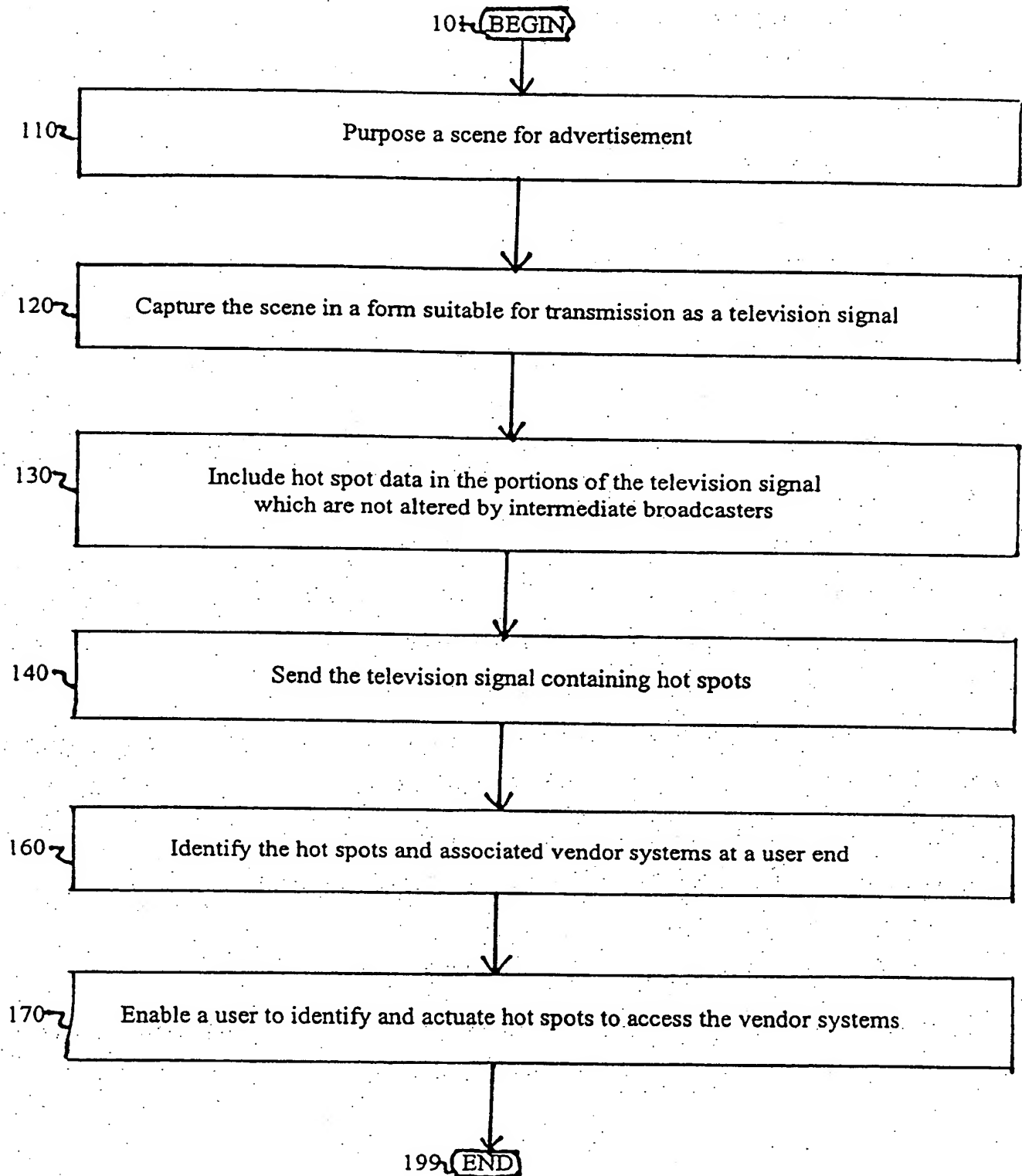


Figure 1

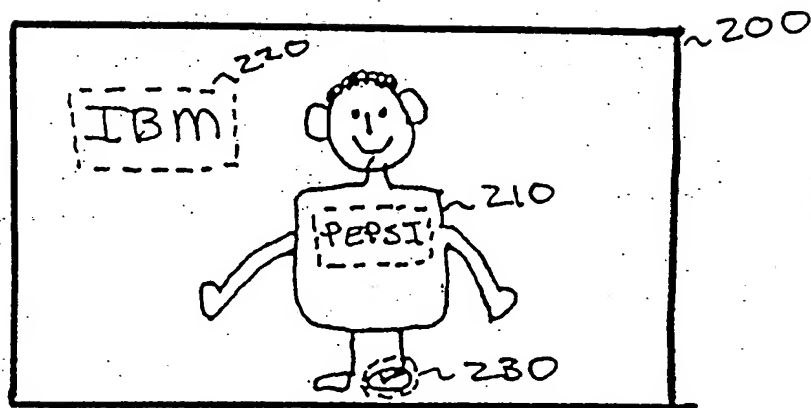


FIGURE 2

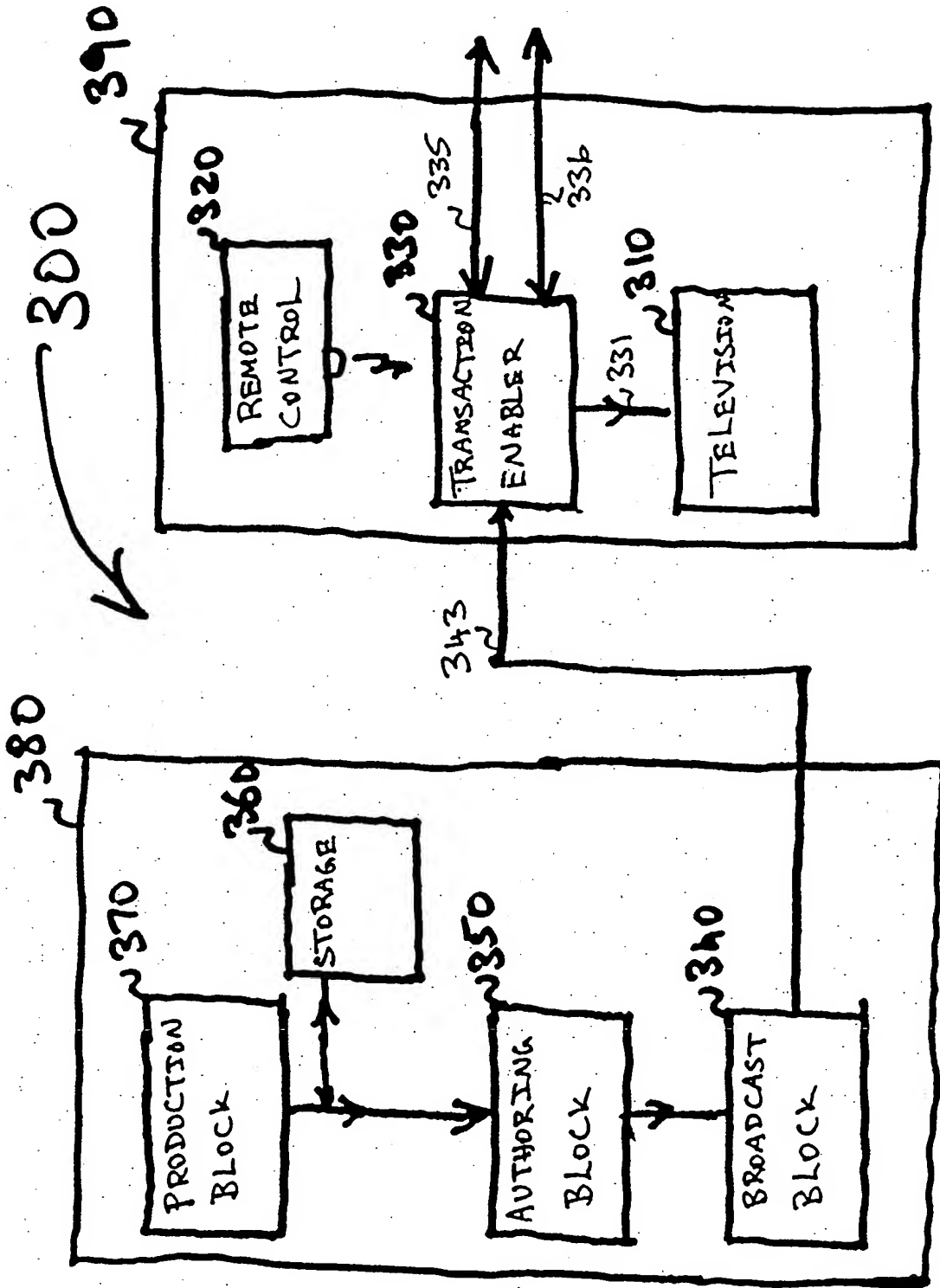


FIGURE 3

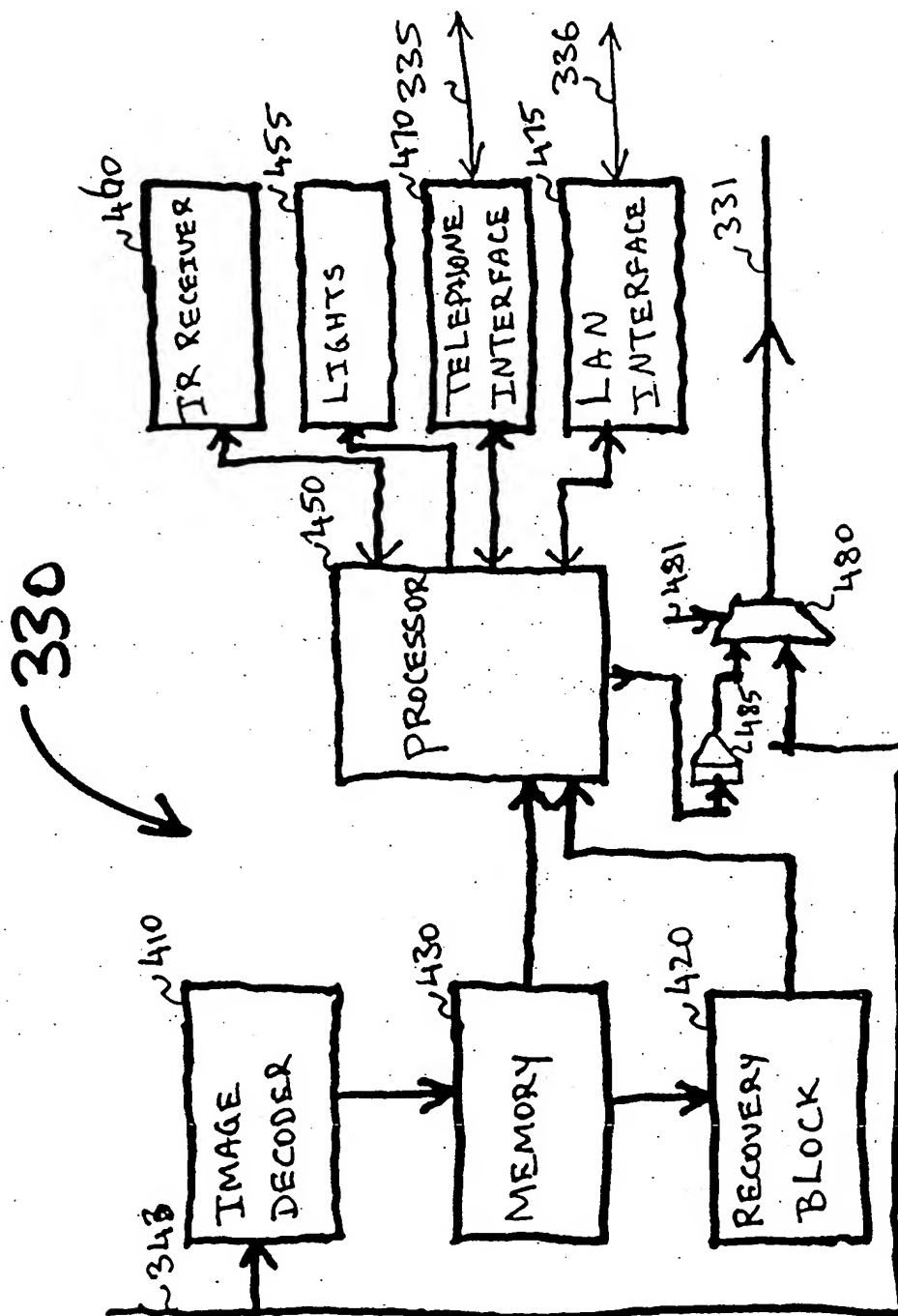


FIGURE 4

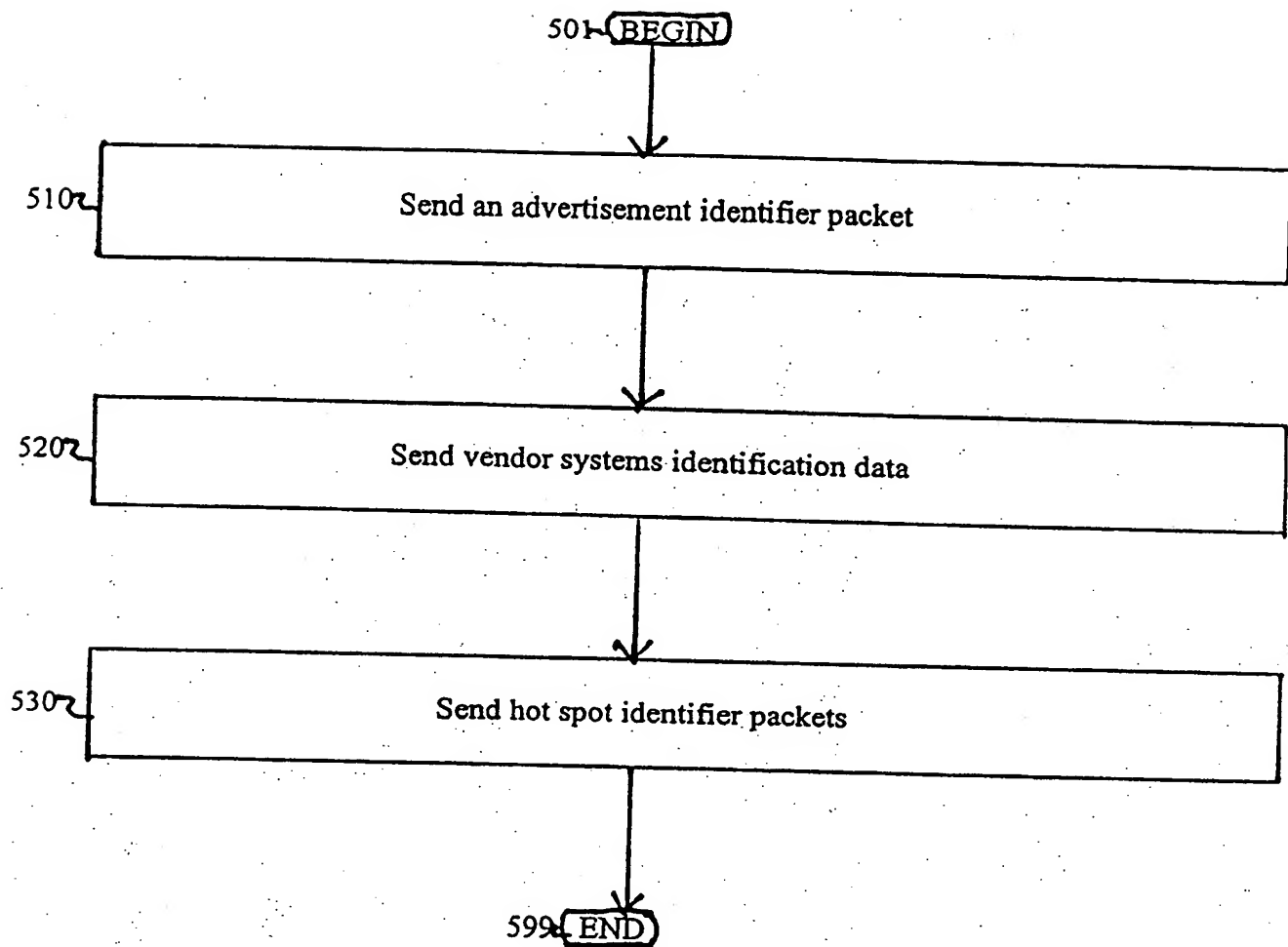


Figure 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/08010**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) :G06F 15/16; H04H 1/00, 1/02, 1/14; H04N 7/10, 7/14

US CL :709/217, 219; 348/13, 12, 6, 7; 455/5.1, 6.1, 6.2, 6.3, 3.1, 4.2

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 709/217, 219; 348/13, 12, 6, 7; 455/5.1, 6.1, 6.2, 6.3, 3.1, 4.2

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONEElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
STN - hot spot, insertion, URL, commercials, frame, pixel, broadcast**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|-----------------------|
| X | US 5,818,935 A (MAA) 06 October 1998, col. 2, lines 48-67, col. 3, lines 1-59; col. 4, lines 20-67, col. 5, lines 1-64; col. 8, lines 1-67, col. 9, lines 1-44, fig. 1 | 1-19 |
| A | US 5,818,441 A (THROCKMORTON et al) 06 October 1998 | 1-19 |
| A | US 5,790,201 A (ANTOS) 04 August 1998 | 1-19 |
| A, P | US 5,889,950 A (KUZMA) 30 March 1999 | 1-19 |
| A, P | US 6,029,045 A (PICCO et al) 22 February 2000 | 1-19 |

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

| | |
|---|--|
| * Special categories of cited documents: | *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention |
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| *B* earlier document published on or after the international filing date | *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |
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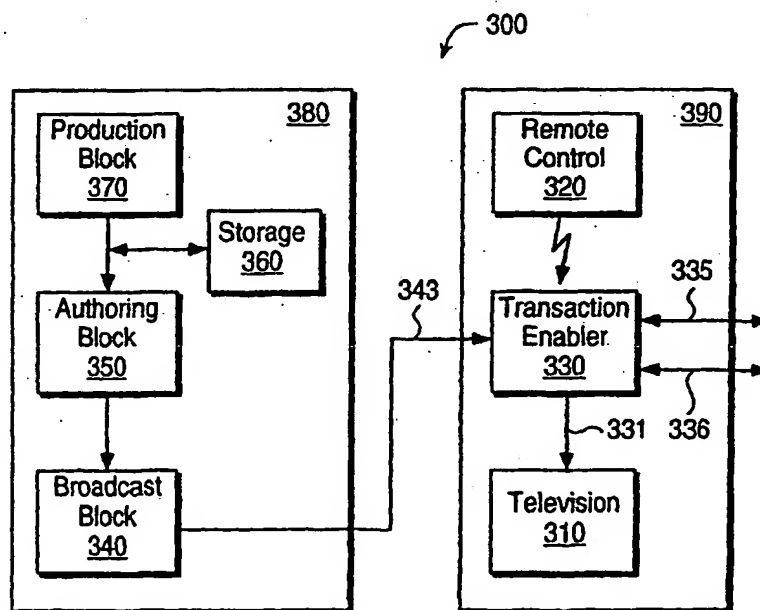
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(54) Title: ENCODING HOT SPOTS IN TELEVISION SIGNALS



(57) Abstract: Hot spot data is encoded in portions such as the display data portion of a television signal such that the encoded hot spot data is unaffected by any alteration to television signals performed by intermediate broadcasters. Hot spot data may include data identifying the location of hot spots in an image frame and vendor system data associated with the hot spots. A transaction enabler block (330) may display images represented by the image frames and enable a viewer to access vendor systems by selecting the hot spot areas via a remote control (320).

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Encoding Hot Spots in Television Signals

Related Applications

The present invention is related to the following U.S. Patent Applications, which are incorporated in their entirety herewith:

- (1) Patent Application Entitled, "A Method and Apparatus for Enabling Viewers of Television Systems to Conveniently Access Various Vendor Systems", Serial Number: 09/183,649, Filed: October 30, 1998 (hereafter, "Related Application 1"); and
- (2) Patent Application Entitled, "Generating Hot Spots Containing Targeted Advertisements in Television Displays", Serial Number: Unassigned, and filed concurrently herewith ("Related Application 2").

Background of the Invention

Field of the Invention

The present invention relates to television systems, and more specifically to a method and apparatus for encoding hot spots in television signals.

Related Art

Television systems are generally used to display images encoded in a television signal. A television signal typically contains several image frames, and television systems are generally designed to process the television signal to display the image frames. The television signal may be in progressive or interlaced formats designed for analog or digital television systems, and can be in one of several known formats such as NTSC, PAL, ATSC, or SECAM.

"Hot Spots" are often specified in television signals. A hot spot generally refers to a portion of a displayed image, which (portion) can be selected by a user (or viewer), and a pre-specified associated action is performed in response to the selection. The user may select the hot spot by 'clicking' on (or otherwise actuating) the displayed image portion. In a common

situation, a hot spot represents an advertisement and the associated action enables the user to access vendor systems related to the advertizing party.

A vendor system may be, among others, a web server or a telephone call processing system. Vendor systems generally enable a user to purchase a service or product, or to access additional information about the advertized product or vendor. Some example embodiments enabling a user to conveniently access various vendor systems are described in RELATED APPLICATION 1.

Due to the convenience of accessing vendor systems from locations such as homes while watching television programs, it may be desirable that hot spots be incorporated into television signals. RELATED APPLICATION 1 discloses a system in which a broadcaster may encode data identifying hot spots in non-display portion (e.g., blanking intervals) of a television signal, and a transaction enabler block enables a user to access the encoded vendor systems.

One problem with including hot spot identification data in non-display portion is that any intermediate broadcasters may alter the some portions of the television signals while rebroadcasting the signals. The result of such alteration is that the hot spot data may not be available when the television signals are received at a television system, and a viewer may not be able to access the vendor systems specified in the television signals.

Accordingly, what is needed is a method and apparatus for encoding hot spots in television signals without being affected by rebroadcasts by intermediate broadcasters.

Summary of the Invention

The present invention is directed to sending hot spot data in television signals. Hot spot data generally includes data specifying the portions of the images forming hot spots, vendor systems associated with each hot spot. Hot spot data may contain other information

such as that identifying an advertizer to which the vendor system may relate to.

In accordance with the present invention, hot spot data is encoded in the portions of the television signal, which are not generally altered by intermediate broadcasters. As is well known in the relevant arts, several portions of the television signals are typically not altered by the broadcasters according to broadcast conventions. The broadcast conventions are generally dictated by various government regulations, technological considerations, and the typical requirement to preserve the integrity of the images encoded in the television signals.

In one embodiment, hot spot data is encoded in the display data portion of a television signal as that portion is generally not altered by intermediate broadcasters. Display data portion generally refers to the signal portion that represents image frames. However, other portions of television signal image such as audio channel, closed captioning portions can also be used to encode the hot spot data.

A transaction enabler block at a user's (or viewer's) end receives a television signal with hot spot data and recovers the hot spot data. The transaction enabler may provide a convenient user interface to enable a user to access the vendor systems associated with each hot spot. The user may simply need to click on (or actuate) a portion of a displayed image frame corresponding to a hot spot, and the user can access any vendor systems associated with the actuated hot spot. As the display data (or any other television signal portion not generally altered) is generally not modified while the television signal is being transmitted from a broadcaster to a viewer, the hot spot data can be sent to viewers of television programs without risk of modification of data by intermediate broadcasters.

Any display distortion effects due to the encoding of hot spot data (in the display data) are minimized in accordance with the present invention. In an embodiment, pixel data elements representing the image frames are generated and the hot spot data is encoded using

the least significant bits of the pixel data elements. Such techniques are generally similar to invisible water-marking techniques and various water-marking techniques can be used for encoding the hot spot data in the display data portion. In another embodiment, hot spot data is encoded closer to the edges of the image frames as viewers typically focus at the center of image frames.

Before recovering hot spot data and enabling a user to access the vendor systems specified in the hot spot data, a transaction enabler may first need to accurately determine whether a received television signal contains hot spot data or not. It may be further desirable that the a separate channel not be used for sending any data required for such purpose.

Accordingly, data indicating whether hot spot data is encoded in the television signals is encoded in the portions not generally altered by intermediate broadcasters. One of several 'self-encoding' techniques can be used for indicating whether hot spot data is encoded. A self-encoding technique generally allows for encoding of additional data at a broadcasters end according to a pre-determined convention, and the transaction block can examine the received data (including potentially the hot spot data and additional data), and determine that hot spot data is encoded. A cyclic redundancy check (CRC) based scheme is an example of one such approach. Thus, a transaction enabler may first determine that a received television signal contains hot spot data, and provide the necessary interface for a user to access various specified vendor systems.

Therefore, the present invention provides a convenient mechanism by which a viewer of a television system can access vendor systems, typically related to the advertisers. This is enabled by including access addresses in the portions of a television signal not typically altered by any intermediate broadcasters.

The present invention ensures that hot spot data is available at user's end irrespective

of any modification of non-display portion of a television signal by intermediate broadcasters as the hot spot data is encoded in the portions of the television signals which are not altered by any intermediate broadcasters.

5 The present invention minimizes any display distortions due to encoding hot spot data in display data portion as the hot spot data is encoded in least significant bits of pixel data elements representing an image frame.

The present invention may further minimize the effect on viewer perception by encoding the hot spot data more towards the edges of image frames than towards the center.

10 Further features and advantages of the invention, as well as the structure and operation of various embodiments of the invention, are described in detail below with reference to the accompanying drawings. In the drawings, like reference numbers generally indicate identical, functionally similar, and/or structurally similar elements. The drawing in which an element first appears is indicated by the leftmost digit(s) in the corresponding reference number.

Brief Description of the Drawings

15 The present invention will be described with reference to the accompanying drawings, wherein:

Figure 1 is a flow-chart illustrating a method according to the present invention;

Figure 2 is a diagram illustrating a hot spots in an image frame;

20 Figure 3 is a block diagram illustrating a typical scenario in which the present invention operates;

Figure 4 is a block diagram illustrating the detail of a transaction enabler block in one embodiment of the present invention; and

Figure 5 is a flow-chart illustrating an example scheme of encoding hot spot data.

Detailed Description of the Preferred Embodiments

1. Overview and Discussion of the Invention

The present invention enables data related to hot spots ("hot spot data") to be transmitted without the risk of alteration (or elimination) of the hot spot data by encoding the hot spot data in the portions of television signals which are not altered by any intermediate
5 broadcasters. As is well known in the relevant arts, intermediate broadcasters rebroadcast television signals according to broadcast conventions, which specify which portions of a television signal are not altered. In the present application, hot spot data generally includes data identifying the portion of a displayed image forming a hot spot and vendor systems
10 associated with the hot spots. Hot spot data may contain other types of information, for example, data identifying the advertisers, the nature of the products/services advertized, etc.

For illustration purpose, the present invention is described with reference to the encoding of hot spot data in the display portion of a television signal. However, in accordance with the present invention, the hot spot data can be encoded in other portions of the television
15 signals (e.g., audio channel, closed captioning portion) which are not altered by any intermediate broadcasters. Display portion commonly refers to the portion of a television signal which encodes the image frames displayed on a television display screen. In contrast, non-display portion generally separates successively encoded image frames (e.g., by using VSYNC), and successive horizontal lines in a frame (by using HSYNC signals) as is well
20 known in the relevant arts. The non-display portion is received during vertical retrace periods and horizontal retrace periods as is also well-known in the relevant arts.

Even though the hot spot data is encoded in the display portion of television signals, an encoding scheme in accordance with the present invention ensures that any display aberrations due to the encoding of hot spots are minimized by employing a combination of

several approaches. The present invention is described below in further detail with respect to several example methods and environments.

2. Method

Figure 1 is a flow chart illustrating a method according to the present invention. In
5 step 110, a party (typically a broadcaster) purposes a scene for advertisement. Purposing generally refers to arranging of the components of the scene such that the desired portions (typically corresponding to hot spots) have required focus, lighting, etc., as the party may wish.

In step 120, the scene is captured on a medium (any recording medium), preferably in
10 a form suitable for eventual transmission as a television signal. The television signal may be transmitted as an interlaced or progressive scan signal using analog or digital transmission standards. The scene is captured in a known way.

In step 130, the hot spot data is encoded in the portions of the television signal which
are not altered by intermediate broadcasters. As is well known in the relevant arts,
15 broadcasters rebroadcast television signals according to a rebroadcast convention, which specifies which portions of a television signals may not be altered while rebroadcasting. As a result, the hot spot data may not be modified or deleted during rebroadcasts by intermediate broadcasters.

In an embodiment, the hot spot data is encoded in the display data portion of the
20 captured television signal. An example encoding scheme is described below with reference to Figure 5. Typically, encoding is performed by processing digital pixel data elements representing the images in the image frames. In the case of digital broadcast signals, the digital pixel data elements are readily available. In the case of analog broadcast signals, the pixel data elements may be generated by digitizing the image frames otherwise encoded in the

display data portion.

As the display data is typically unaltered by any intermediate broadcasters, the present invention enables hot spot data to be transmitted to user systems without being affected in the path. Hot spot data may be incorporated using various tools available in the industry. For example, software and hardware available from Silicon Graphics (www.sgi.com) and Avid (www.avid.com) can be used to encode the hot spot data.

Hot spot data needs to identify the location of hot spots and corresponding vendor systems (e.g., URLs, telephone numbers, and hot spot identification data). In general, it is preferable that the hot spot data be contained in each image frame. However, a convention can be employed to make hot spot data effective for a number of successive frames according to a pre-determined protocol. Some considerations in encoding and an example encoding scheme are described below in further detail.

In step 140, the television signal containing hot spots is transmitted. In step 160, the hot spot data is recovered at a user end. The recovery needs to be consistent with the encoding scheme employed in step 130. Therefore, any consistent scheme can be chosen for communicating hot spots and associated vendor systems. In step 170, a user is enabled to actuate (or select) hot spots and access the associated vendor systems.

Thus, the method of Figure 1 can be used to transmit hot spot data in display portion of a television signal and the user can be provided access to various vendor systems depending on the actuation of hot spots. Some general considerations in encoding hot spot data are noted first and the manner in which the hot spot data can be recovered (decoded) is described next.

3. Hot Spot Data

Figures 2 and 5 together illustrate an example encoding scheme for sending hot spot related data. Specifically, Figure 2 depicts a sample image frame 200 having hot spots 210

(Pepsi Logo on a T-Shirt), 220 (Nike Advertisement on a shoe), and 230 (IBM Advertisement in the background) for three advertisers Pepsi, IBM, and Nike respectively. For purposes of explanation, dotted lines are shown around each hot spot. Hot spot data corresponding to the three advertisements may be encoded in the display data portion of a television signal in accordance with the present invention.

Figure 5 is a flow-chart illustrating an example method for sending spot data related to the three hot spots. In step 510, an advertisement identifier packet may be sent, with the packet containing an object identifier, date and time of broadcast, advertizer identifier and control data. An object identifier may uniquely identify each advertisement, the date and time field may specify the broadcast time, advertizer identifier may uniquely specify an advertizer (e.g., IBM Corporation, Nike Corporation) to which the advertisement relates to. Control data may be used for generating targeted advertisements as described in further detail in RELATED APPLICATION 2. With reference to Figure 2, three advertisement identifier packets may be sent one corresponding to each of the hot spots 210, 220 and 230.

In step 520, vendor system identification data associated with each hot spot area (advertisement) may be sent. In case a vendor system corresponds to a web server, the vendor system identification data corresponds to an URL as is well known in the relevant arts. All the information may be encoded in a known way, for example, in ASCII format. In an embodiment, vendor system identification data is sent in a packet with an object identifier (3 bits) and an associated URL (400 bits)

Even though step 520 is described with reference to using web servers as vendor systems, vendor systems may include other types of systems, and the vendor system identification data packets are correspondingly designed. For example, a web access address (e.g., URL) may be associated with hot spot 210, a web access address and telephone number

(with a live operator) may be associated with hot spot 220, and a telephone number (with a fax back service) may be associated with hot spot 230.

In step 530, hot spot identifier packets may be sent. Each hot spot identifier packet may contain data identifying the location of the hot spots. In an embodiment, each image may be viewed as having X and Y coordinates, with the top-left corner being viewed as (0, 0) coordinate. Hot spot 220 may be identified by the used rectangle area. In an embodiment, nine bits may be used for X coordinate and eight bits may be used for Y coordinate, and each packet may contain an object identifier, an X coordinate and a Y-coordinate.

Typically, a hot spot identifier packet may be sent first when the corresponding hot spot is first (in time) present in an image frame. An additional identifier packet may be sent each time the hot spot location changes in the image frames. This additional packet indicates the new location of the hot spot.

However, a different approach may be used for hot spots having consistent uniform mobility. For example, a ball may be moving in a trajectory and the ball may need to be identified as a hot-spot. The coordinates of the ball may be sent with each image to correspond to the movement. In the alternative, the movement may be characterized by a mathematical equation, with the equation defining, for example, a piecewise linear trajectory.

The online access addresses, approaches for identifying the hot spots and associating online access addresses are merely illustrative. Several variations can be used as will be apparent to one skilled in the relevant arts based on the disclosure provided herein. Such other approaches are contemplated to be within the scope and spirit of the present invention.

4. Encoding in Display Data Portion

An objective in one embodiment is to encode hot spot data while minimally affecting the picture quality and accuracy from a viewer perspective. Various techniques can be

employed to meet such an objective. Some examples are described below.

In general, the image frames are first digitized if necessary. The hot spot data is then encoded, preferably in the least significant bit(s) of each pixel data element of an image frame. By using only the least significant bit(s), the user may not perceive a significant difference in the displayed images compared to what would have been displayed without encoding the hot spot data in the display data portion. Such techniques are generally referred to as water-marking techniques in the relevant arts. Other water-marking techniques can be implemented as well.

Depending on the number of hot spots and the data to be encoded, only a subset of the pixel data elements can be used for encoding the hot spot data according to a pre-determined convention. In an embodiment, only alternate pixel data elements in a line may be used such that the minor modifications due to encoding of hot spot data is not generally perceived by the human eye. This is one example of many well-known techniques for encoding data into images so that the image quality is not significantly degraded.

An alternative embodiment may use pixels which are located near the edges of the image frames as human eye tends to focus more on the central portion of image frames. Another embodiment may encode hot spot data across multiple frames if one frame is not sufficient to encode the desired hot spot data. Yet another embodiment may use pixel positions in the image frame position corresponding to under the monitor bezel as that portion is generally not displayed. Various other approaches can be used for encoding the hot spot as will be apparent to one skilled in the relevant arts. Such approaches are contemplated to be within the scope and spirit of the present invention. An example environment using some of these approaches is described below with reference to Figure 3.

5. Example Environment

Figure 3 illustrates an example system 300 in which the present invention can be implemented. System 300 includes production block 370, storage 360, authoring block 350, and broadcast block 340 at broadcaster end 380. System 300 further includes transaction
5 enabler 330, television 310 and remote control 320 at user end 390.

Broadcaster end 380 generates television signals including hot spot data in the display data portion. The television signals are broadcasted many times directly to user end 390 on broadcast medium 343. However, many times the television signals are rebroadcast by intermediate broadcasters (not shown). During such rebroadcasts, some portions of the
10 television signals may be altered, due to which the hot spot data may be modified or deleted altogether. However, the portions of the television signal which may be altered are specified in rebroadcast conventions as is well known in the relevant arts. The present invention takes advantage of the conventions and encodes the hot spot data in the television signal portions which are not altered by intermediate broadcasters.

15 User end 390 receives the television signals and displays the encoded images on a television display screen. In addition, user end 390 enables a user to access various vendor systems by actuating the hot spots defined by the encoded hot spot data. The details of broadcaster end 380 and user end 390 are described in further detail below.

Production block 370 may contain different components such as cameras which are
20 used to film a show. The resulting display signal may be stored in storage 360. The display signal is preferably in a form suitable for eventual transmission as a television signal. Production block 370 may be implemented in a known way.

Authoring block 350 processes the display signal to incorporate hot spot data into the display data portion of a television signal. The hot spot data may be designed in accordance

with the method of flow-charts 1 and 5 described above. In an embodiment, authoring block 350 receives the display signal from storage 360 and incorporates hot spot data in real time, that is, as the production block generates the display signals. Such real time incorporation may be possible in computer animation type applications. However, such real time incorporation may be impractical in many other situations. In such a situation, storage 360 may be used as an intermediate buffer.

Authoring block 350 may encode hot spot data using the approaches described above. In general, pixel data elements representing an image frame are generated and hot spot data is encoded preferably in the least significant bit(s) of the pixel data elements. Additional data for error detection and correction can also be encoded according to one of several well-known schemes. The implementation of authoring block 350 will be apparent to one skilled in the relevant arts based on the disclosure herein. Even though production block 370 and authoring block 350 are described as different components, it should be understood that the two blocks may be combined into a single block, particularly when the computer animation is being used.

Broadcast block 340 may broadcast television signals (containing the hot spot data in the display data portion) in a known way. It should be noted that the television signal can be in progressive scan or interlaced format. Production block and authoring block 350 need to be implemented taking into consideration the transmission standard of the television signals. Thus, broadcaster end 380 generates television signals containing hot spot data in the display data portion.

Now turning to user end 390, television system 310 displays the images encoded in a television signal received on line 331. As described below in further detail, transaction enabler 330 enables users (or viewers of television 310) to access various vendor systems

specified by the hot spot data encoded in the television signal received from broadcast block 340.

Transaction enabler 330 may be included at any point in the television signal path including, for example, within a television receiver, within a set-top box, or within a VCR or DVD players. Such integration into a single device will be apparent to one skilled in the relevant arts.

The operation of transaction enabler 330 may be controlled from remote control unit 320 by a user. Even though remote control unit 320 is described below as interfacing with transaction enabler 330 using remote signals (e.g., infra-red signals), it should be understood that other forms of control units may be employed to control transaction enabler 330. A user may operate remote control unit 320 to access various vendor systems in accordance with the present invention.

Transaction enabler 330 decodes the hot spot data in the television signals received from broadcast block 340 and enables a user to access various vendor systems by actuating the hot spots. To enable such access, transaction enabler 330 may need to have access to a web connection using connection 336 and /or telephone line using lines 335. In addition, transaction enabler 330 may need to generate new or supplemental image frames on line 331 for a convenient user interface. An embodiment of transaction enabler 330 is described below in further detail.

6. Transaction Enabler

Figure 4 is a block diagram illustrating the internals of an example embodiment of transaction enabler 330. Only the details of transaction enabler 330 as may be applicable to the present application are described here. Additional details are described in RELATED APPLICATION 1.

Image decoder 410 generates pixel data elements representing image frames encoded in a television signal received on line 343. In response to the operation of remote control unit 320, image decoder 410 may store the pixel data elements representing an image frame in memory 430. Image decoder 410 may be implemented in a known way. Memory 430 may represent several memory modules such as fast random access memories and relatively slower non-volatile memories. The non-volatile memories may store data and program instructions which enable the operation of the present invention.

Recovery block 420 may examine the pixel data elements stored in memory 430 to recover the hot spot data encoded in the frame of the television signal received from broadcaster end 380. In general, recovery block 420 needs to be implemented consistent with any conventions or protocols used at broadcaster end 380 for encoding the hot spot data. Assuming that the least significant bit of each pixel data element is used for encoding the hot spot data and any error detection/correction information, recovery block 420 may examine the least significant bit of each pixel data element to decode the hot spot data. Recovery block 420 may be implemented using various digital signal processing techniques also.

Infra-red (IR) receiver 460 receives remote control signals from remote control unit 320, and provides digital data representing the remote control signals to processor 450. IR receiver 460 may be implemented in a known way. It may be noted that other receivers which receive control signals from viewers and provide corresponding digital data to processor 450 may be implemented.

Telephone interface 470 enables a telephone call to be initiated on line 335. Such telephone calls may be generally initiated either to connect to the Internet via an ISP or to contact a phone with a live-operator. When a telephone call is initiated with a live operation, telephone interface 470 may provide the necessary micro-phone (for a viewer to speak) and

receiver for reproducing audible voice. Alternatively, a user may utilize a conventional telephone set that is attached to line 335. LAN (local area network) interface 475 may provide a high speed connection to connect with a web server (corresponding to an URL) or even initiate a voice call (e.g., using voice over Internet Protocol).

5 Processor 450 receives the hot spot data from recovery block 420, and enables a user to access various vendor system specified in the hot spots. For a suitable user-interface, processor 450 may control the images displayed on television system 110. As an illustration, when a user does not wish to use the advertisement information or when there is no vendor system information in a received television signal, processor 450 may control select line 481
10 to cause the television signal received on line 331 to be passed directly on line 331. When vendor system information is present in the received television signal, one of the lights 455 may be turned on to indicate that the vendor systems information is present in the television signals. Alternatively, a branded logo may appear on the viewer screen.

When advertisement information (i.e., presence of hot spots) needs to be displayed on
15 television systems, processor 450 may modify the received image frames to provide a suitable user interface. The modification is generally performed by processing the pixel data elements stored in memory 430. Typically, other images (e.g., cursor and advertisement related textual or graphic information) may be overlaid on top of the image frames.

In an embodiment, a user may indicate when the hot spot information needs to be
20 turned ON or OFF. When the information needs to be displayed, processor 450 may overlay the hot spot location information on the image frames contained in a received television signal. For example, the display portions (typically containing objects) corresponding to hot spots may be highlighted to indicate that a vendor system is associated with the portions. A user may click on one of the hot spots, and transaction enabler 330 may display the associated

vendor systems with suitable explanation messages. The user may select one of the vendor systems associated with the selected display portion. Transaction enabler 330 may provide the necessary connection to the selected vendor system.

If the vendor system corresponds to a web-server, transaction enabler 330 may need to operate as a web-browser. Processor 450 may enable such an operation by executing the program instructions provided by memory 430. The web-browser enables transaction enabler 330 to receive different web-pages in a known way. Processor 450 may convert the web pages into image frames, and encode the image frames into a television signal having a format compatible with conventional television signals such that the images can be displayed on television system 110. Well known methods may be employed for such conversion and encoding.

A user may continue to browse the world-wide-web by operating remote control unit 320. As control signals indicating that the cursor needs to be moved are received, processor 450 may need to modify the displayed image frames to indicate the cursor position. When a user clicks on a position corresponding to a new URL in a displayed web-page, transaction enabler 330 may need to fetch a web page with the new URL in a known way. This browsing mechanism may enable a viewer to access additional information from a vendor system.

Thus, transaction enabler 330 of Figure 3 enables a presently displayed advertisement to be selected by a viewer and the viewer may be connected to the corresponding vendor system. In case of web access, transaction enabler 330 may provide the web browsing support. Various modifications can be made to transaction enabler 330 without departing from the scope and spirit of the present invention. Some example modifications are described in RELATED APPLICATION 1.

Also, typically only some of the television signals contain hot spot data and others may

not. When hot spot data is not encoded it may be undesirable to alter the displayed images. As should be apparent from the above description, transaction enabler 330 may alter the images to provide suitable user interface for a user to select the hot spots when hot spots are actually encoded. Accordingly, there is a general need to first determine whether hot spots are
5 actually present in the received television signals.

7. Determining the Presence of Hot Spot

In general, broadcaster end 380 and user end 390 need to be implemented with a consistent interface for the user end 390 to accurately determine the presence of the hot spot data. One of several conventions well known in the relevant arts may be employed to provide
10 such a consistent interface. However, it may be desirable that the chosen convention be 'self-coding', that is, examination of the encoded data itself should indicate that hot spot data is encoded in the television signals. One of several conventions well known in the relevant arts can be used.

In one embodiment described with reference to Figure 3, authoring block 350
15 generates a 'code' is generated using a cyclic redundancy check (CRC) approach. The code is generated such that a pre-determined syndrome is generated when the code along with other hot spot related data is processed by a CRC circuit contained in transaction enabler 330.

Thus, continuing with reference to Figure 4, processor 450 may recover the hot spot data (including the CRC code) by selecting the appropriate bits from the data stored in
20 memory 430. Processor 450 may include a CRC processor (either in hardware, software, firmware, or a combination) which processes the hot spot data to generate a syndrome. If the generated syndrome matches the pre-determined syndrome, processor 450 may determine that the television signals presently being received contain hot spot data.

Then, processor 450 may interpret the recovered data as hot spot containing

information related to vendor systems, etc., as described in detail above. If the recovered data is determined not to contain hot spot data, processor 450 may assert line 481 to cause multiplexor 480 to select the television signal portions received on line 343. The selected signal may be used for display on television 310.

- 5 Thus, the present invention provides an efficient way of determining the presence of hot spot data in a received television signal, and provide user interface to enable a user to access the vendor systems specified by the hot spot data.

8. Conclusion

- 10 While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example only, and not limitation. Thus, the breadth and scope of the present invention should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims and their equivalents.

What Is Claimed Is:

1 1. A method of enabling a viewer of a television system to conveniently access various
2 vendor systems, wherein said television system is designed to receive a television signal from
3 a broadcaster end, wherein an intermediate broadcaster can modify portions of said television
4 signal according to a rebroadcast convention, said method comprising the steps of:

5 (a) encoding hot spot data in a portion of a television signal which cannot be modified
6 by said intermediate broadcaster according to said rebroadcast convention, said hot spot data
7 specifying a hot spot in said image frame and an access address associated with said hot spot,
8 wherein said access address relates to a vendor system and said hot spot corresponds to a
9 portion of said image frame;

10 (b) sending said television signal to a user end;

11 (c) recovering said hot spot data at said user end;

12 (d) displaying said image frame at said user end;

13 (e) enabling said viewer to select said portion of said image frame forming said hot
14 spot; and

15 (f) providing a connection to said vendor system related to said access address,

16 wherein said encoding of step (a) ensures that said hot spot data is available for
17 recovery in step (c).

1 2. The method of claim 1, wherein step (a) comprises the step of encoding said hot
2 spot data in a display portion of said television signal, wherein said display portion comprises
3 an image frame.

1 3. The method of claim 2, wherein step (a) further comprises the steps of:

- 2 (g) generating a plurality of pixel data elements representing said image frame; and
3 (h) encoding said hot spot data using one or more of the least significant bits of at least
4 some of said plurality of pixel data elements.

1 4. The method of claim 3, wherein step (h) comprises the step of encoding said hot
2 spot data towards the edges of said image frame.

1 5. The method of claim 3, wherein step (h) comprises the step of encoding said hot
2 spot in a subset of said plurality of pixel data elements.

1 6. The method of claim 1, wherein said hot spot data is encoded in each image frame
2 encoded in said television signal.

1 7. The method of claim 1, wherein said access address comprises a universal resource
2 locator (URL).

1 8. The method of claim 1, further comprising the steps of:

2 (l) encoding data in said television signal at some broadcasters end indicating whether
3 said hot spot is encoded in said television signal;

4 (m) determining at said user end whether said hot spot data is encoded in step (l) using
5 said data encoded in step (l); and

6 (n) performing step (e) only if step (m) determines that said hot spot data is encoded.

1 9. The method of claim 1, wherein said image frame is displayed on said television
2 system.

1 10. A system enabling a viewer of a television system to conveniently access various
2 vendor systems, wherein said television system is designed to receive a television signal from
3 a broadcaster end, wherein an intermediate broadcaster can modify portions of said television
4 signal according to a rebroadcast convention, said system comprising:

5 a broadcaster end for encoding hot spot data in a portion of a television signal which
6 cannot be modified by said intermediate broadcaster according to said rebroadcast convention,
7 said hot spot data specifying a hot spot in said image frame and an access address associated
8 with said hot spot, wherein said access address specifies a vendor system; and

9 a user end comprising said television system, said user end recovering said hot spot
10 data, said user end also displaying said frame on said television system to enable said viewer
11 to select said hot spot and access said vendor system associated with said access address,

12 wherein said encoding by said broadcaster end ensures that said hot spot data is
13 available at said user end without modification by said intermediate broadcaster.

1 11. The system of claim 10, wherein said hot spot data is encoded in a display portion
2 of said television signal, wherein said display portion contains an image frame.

1 12. The system of claim 11, wherein said user end comprises a transaction enabler
2 block, said transaction enabler block recovering said hot spot data and generating new image
3 frames for display on a display screen of said television system, wherein said new image
4 frames provide a convenient interface for said viewer to select said hot spot.

1 13. The system of claim 12, wherein said broadcaster end encodes said hot spot data
2 in the least significant bit of a first plurality of pixel data elements forming said image frame.

1 14. The system of claim 13, wherein said transaction enabler block comprises:
2 an image decoder for receiving said image frame and generating a second plurality of
3 pixel data elements representing said image frame;
4 a recovery block for recovering said hot spot data by examining said second plurality
5 of pixel data elements; and
6 a processor for generating said new image frames according to said recovered hot spot
7 data.

1 15. The system of claim 11, wherein said broadcaster end comprises:
2 a production block for capturing a view as a signal;
3 a storage for storing said signal;
4 an authoring block for encoding said hot spot data into the display data portion of said
5 signal; and
6 a broadcast block for transmitting said signal as said television signal.

1 16. The system of claim 11, wherein said image frame is in interlaced format.

1 17. The system of claim 11, wherein said image frame is in a progressive scan format.

1 18. The system of claim 11, wherein said transaction enabler block is provided
2 external to said television system.

1 19. A method of sending data from a broadcaster end to a television system, wherein

an intermediate broadcaster can modify portions of said television signal according to a rebroadcast convention, said method comprising:

(a) encoding said data in a portion of a television signal which cannot be modified by said intermediate broadcaster according to said rebroadcast convention, said television signal containing an image frame;

(b) sending said television signal to a user end containing said television system;

(c) recovering said data at said user end; and

(d) displaying said image frame at said user end,

wherein said convention enables said broadcaster to send said data without risk of modification by said intermediate broadcaster while sending image frames for display.

FIG. 1

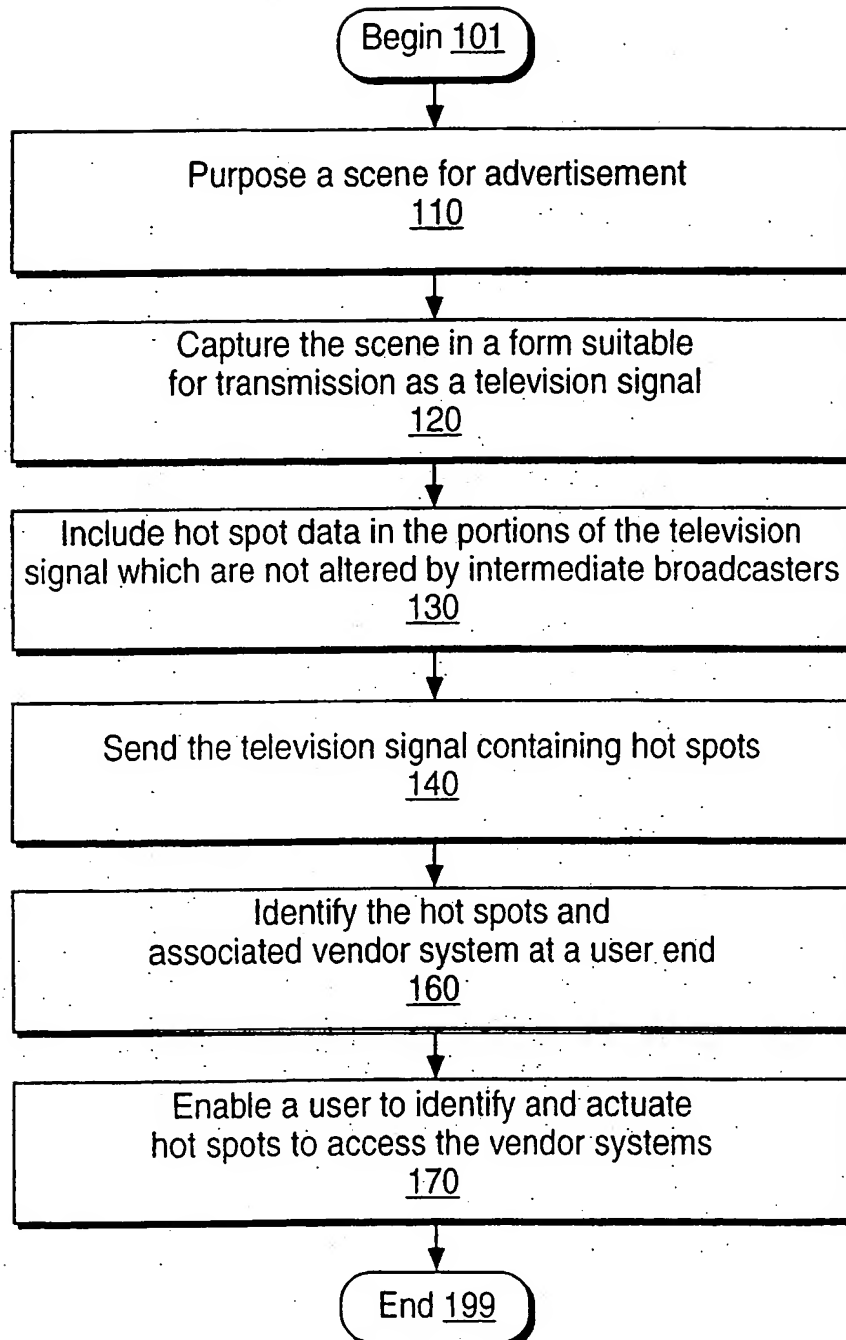
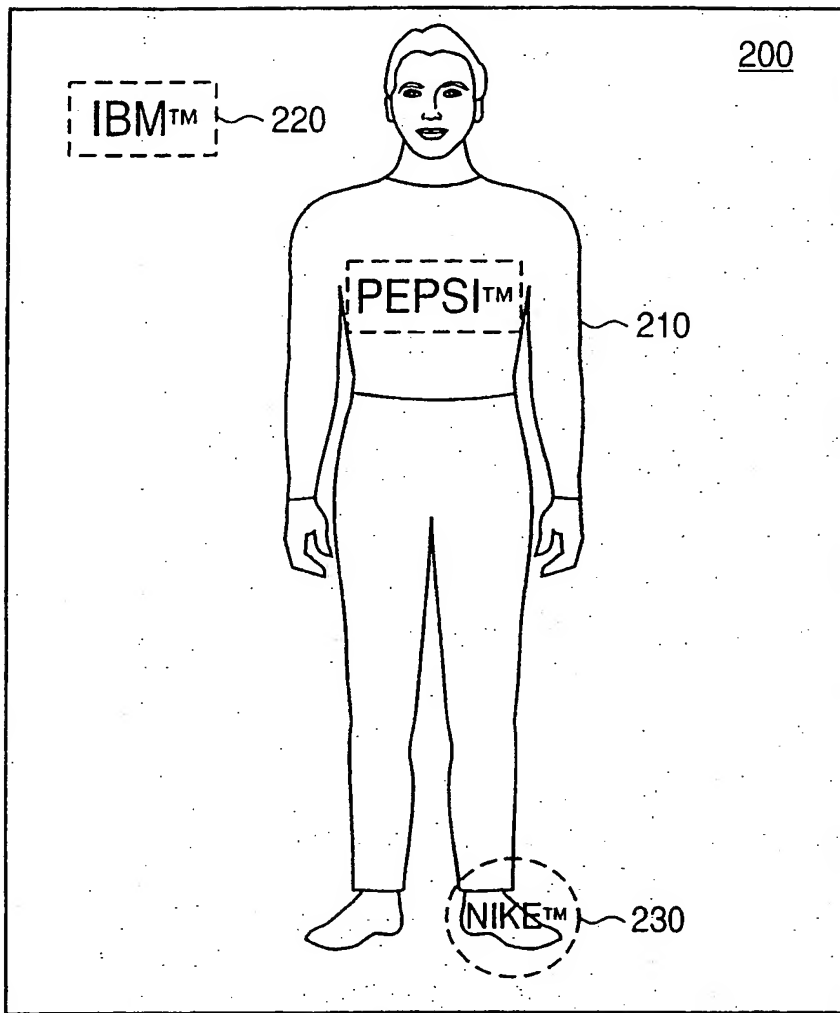


FIG. 2



3/5

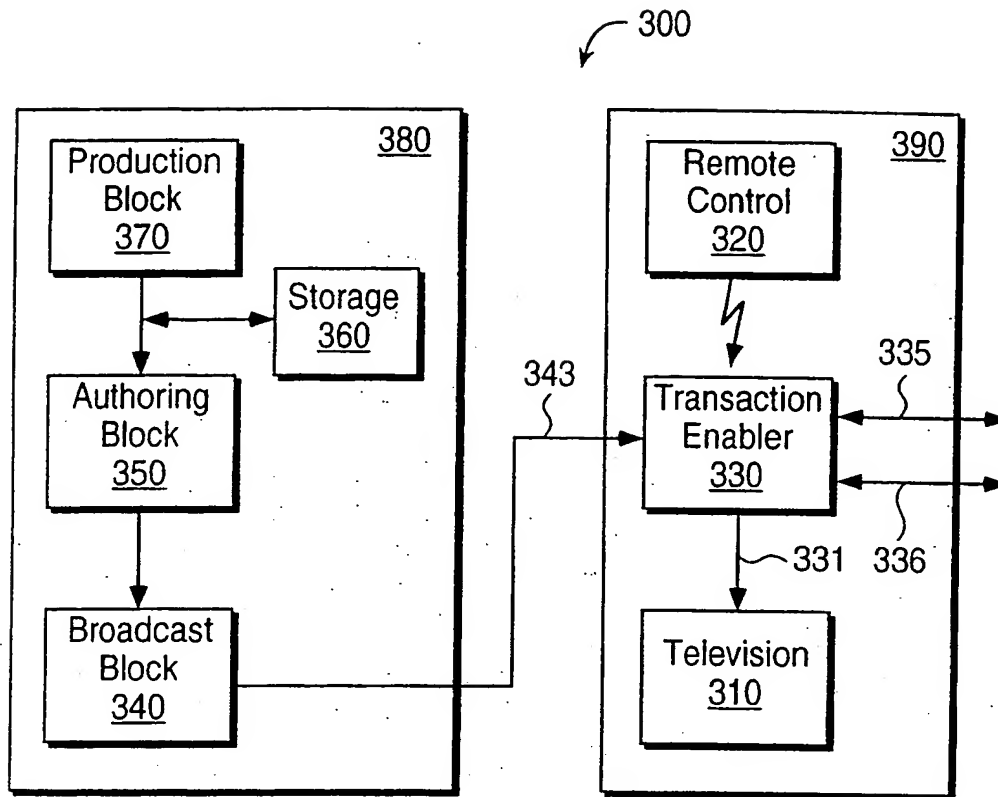


FIG. 3

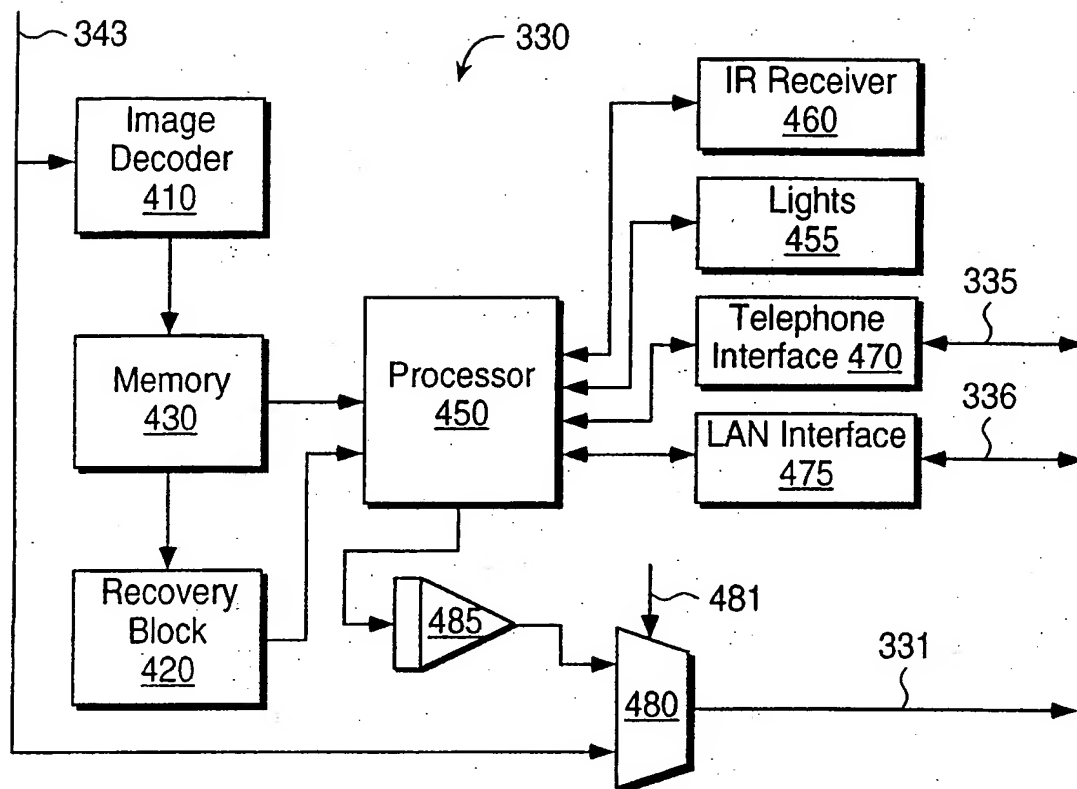
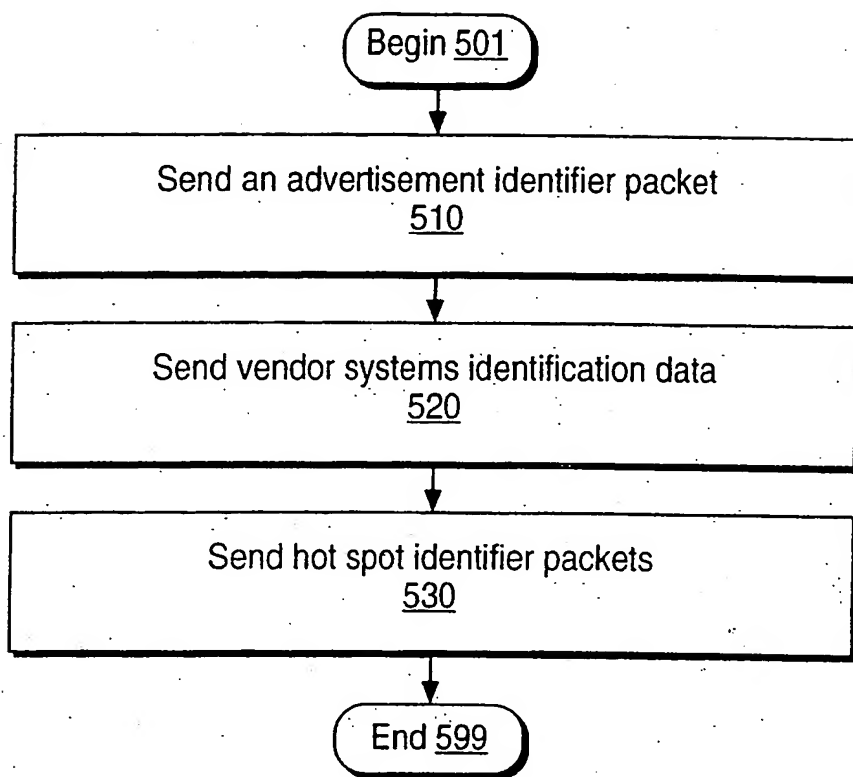


FIG. 4

FIG. 5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US00/08010

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G06F 15/16; H04H 1/00, 1/02, 1/14; H04N 7/10, 7/14

US CL : 709/217, 219; 348/13, 12, 6, 7; 455/5.1, 6.1, 6.2, 6.3, 3.1, 4.2

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 709/217, 219; 348/13, 12, 6, 7; 455/5.1, 6.1, 6.2, 6.3, 3.1, 4.2

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

STN - hot spot, insertion, URL, commercials, frame, pixel, broadcast

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|-----------------------|
| X | US 5,818,935 A (MAA) 06 October 1998, col. 2, lines 48-67, col. 3, lines 1-59, col. 4, lines 20-67, col. 5, lines 1-64, col. 8, lines 1-67, col. 9, lines 1-44, fig. 1 | 1-19 |
| A | US 5,818,441 A (THROCKMORTON et al) 06 October 1998 | 1-19 |
| A | US 5,790,201 A (ANTOS) 04 August 1998 | 1-19 |
| A, P | US 5,889,950 A (KUZMA) 30 March 1999 | 1-19 |
| A, P | US 6,029,045 A (PICCO et al) 22 February 2000 | 1-19 |

☐ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

| | |
|---|--|
| * Special categories of cited documents: | *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention |
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| *E* earlier document published on or after the international filing date | *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |
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| *P* document published prior to the international filing date but later than the priority date claimed | |

| | |
|---|---|
| Date of the actual completion of the international search 06 JULY 2000 | Date of mailing of the international search report 26 JUL 2000 |
| Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230 | Authorized officer Vivek Srivastava Telephone No. (703) 305 - 4038 Joni Hill |

Form PCT/ISA/210 (second sheet) (July 1998)*